

### **Listing Of Claims:**

This listing of claims will replace all prior versions and listings of claims in the application.

1. (Withdrawn) A method of aggregating a plurality of blocks related to a design configuration for extracting material from a particular location, the method including the steps of:
  - determining a selected volume of material to be extracted,
  - dividing at least a portion of the selected volume into blocks,
  - forming at least one cluster, and
  - propagating from at least one cluster, a cone.
2. (Withdrawn) A method as claimed in claim 1, further including the step of determining from intersections of the cones, a clump.
3. (Withdrawn) A method as claimed in claim 1, wherein the cone is propagated upwards using precedence arcs.
4. (Withdrawn) A method as claimed in claim 1, wherein the cone is three dimensional.
5. (Withdrawn) A method as claimed in claim 1, wherein the cone is minimal.
6. (Withdrawn) A method as claimed in claim 1, wherein the cone includes a number of blocks.
7. (Withdrawn) A method as claimed in claim 2, wherein the precedence arcs relate to an extraction order of corresponding clump(s) and / or block(s).

8. (Withdrawn) A method of determining slope constraints related to a design configuration for extracting material from a particular location, the method including the steps of:

using precedent arcs of blocks emanating from a selected clump to establish, at least in part, clump precedents.

9. (Withdrawn) A computer program product including:

a computer usable medium having computer readable program code and computer readable system code embodied on said medium for determining slope constraints related to a design configuration for extracting material from a particular location within a data processing system, said computer program product including:

computer readable code within said computer usable medium for performing the method as claimed in 1.

10. (Withdrawn) Apparatus adapted to aggregating a plurality of blocks related to a design configuration for extracting material from a particular location, the apparatus including:

first means for determining a selected volume of material to be extracted,  
second means for dividing at least a portion of the selected volume into blocks,  
third means for forming at least one cluster, and  
fourth means for propagating from at least one cluster, a cone.

11. (Withdrawn) Apparatus adapted to determining slope constraints related to a design configuration for extracting material from a particular location, the apparatus including:

first means for using precedent arcs of blocks emanating from a selected clump to establish, at least in part, clump precedents.

12. (Withdrawn) Apparatus adapted to aggregating a plurality of blocks related to a design configuration for extracting material from a particular location, the apparatus including:

processor means adapted to operate in accordance with a predetermined instruction set,

said apparatus, in conjunction with said instruction set, being adapted to perform the method as claimed in claim 1.

13. (Withdrawn) Apparatus adapted to determining slope constraints related to a design configuration for extracting material from a particular location, the apparatus including:

processor means adapted to operate in accordance with a predetermined instruction set,

said apparatus, in conjunction with said instruction set, being adapted to perform the method as claimed in claim 1.

14. (Withdrawn) A method of determining a cluster of material, the method including the steps of:

allocating at least a portion of the material between a plurality of blocks,  
determining a first attribute related to co-ordinates corresponding to each block,  
assigning the first attribute to each corresponding block,  
determining a second and / or at least one further attribute(s) related to the plurality of blocks, and

aggregating at least two of the plurality of blocks in accordance with the first attribute and the second attribute.

15. (Withdrawn) A method as claimed in claim 14, wherein the second and / or further attribute(s) provide for distinction between material considered of value, and material considered to be of lesser or little value.
16. (Withdrawn) A method as claimed in claim 14 ~~or 15~~, wherein the second and / or further attribute(s) corresponds to a positive value.
17. (Withdrawn) A method as claimed in claim 14 ~~or 15~~, wherein the second and / or further attribute(s) corresponds to a spatial value.
18. (Withdrawn) A method as claimed in claim 14 ~~or 15~~, wherein the second and / or further attribute(s) corresponds to grade of the material.
19. (Withdrawn) A method as claimed in claim 14, wherein the at least two blocks are aggregated into a larger collection of blocks.
20. (Withdrawn) A method as claimed in claim 14, further including repeating the steps defined to determination a further cluster from material already aggregated.
21. (Withdrawn) A method of removing material from a predetermined location, the method including the steps of:
  - determining a cluster in accordance with claim 14, and
  - scheduling the collections into one or more periods.
22. (Withdrawn) A computer program product including:
  - a computer usable medium having computer readable program code and
  - computer readable system code embodied on said medium for determining slope

constraints related to a design configuration for extracting material from a particular location within a data processing system, said computer program product including:

computer readable code within said computer usable medium for performing the method as claimed in claim 14.

23. (Withdrawn) Apparatus adapted to determining a cluster of material, the apparatus including:

first means for allocating at least a portion of the material between a plurality of blocks,

second means for determining a first attribute related to co-ordinates corresponding to each block,

third means for assigning the first attribute to each corresponding block,

fourth means for determining a second and / or at least one further attribute(s) related to the plurality of blocks, and

fifth means for aggregating at least two of the plurality of blocks in accordance with the first attribute and the second attribute.

24. (Withdrawn) Apparatus adapted to determine the removal of material from a predetermined location, the apparatus including:

first means for determining a cluster in accordance with claim 14, and

second means for scheduling the collections into one or more periods.

25. (Withdrawn) Apparatus adapted to determining a cluster of material, said apparatus including:

processor means adapted to operate in accordance with a predetermined instructions set,

said apparatus, in conjunction with said instruction set, being adapted to perform the method as claimed in claim 14.

26. (Withdrawn) Apparatus adapted to determine the removal of material from a predetermined location, said apparatus including:

processor means adapted to operate in accordance with a predetermined instructions set,

said apparatus, in conjunction with said instruction set, being adapted to perform the method as claimed in claim 14.

27. (Withdrawn) A method of determining characteristics of a selected portion of material, the method including the steps of:

determining the contents of the selected portion of material, and

identifying region(s) of material within the selected portion according to at least one of a plurality of characteristic(s).

28. (Withdrawn) A method as claimed in claim 27, wherein the determination of contents is performed from substantially the lowest level of the selected portion of material, and then upwards.

29. (Withdrawn) A method as claimed in claim 27, wherein the selected portion of material is a clump.

30. (Withdrawn) A method as claimed in claim 27, wherein the characteristics are predetermined.

31. (Withdrawn) A method as claimed in claim 27, wherein at least two of the characteristics reflect one or more grade(s) or value(s) of material.

32. (Withdrawn) A method as claimed in claim 31, wherein the region(s) distinguish between ore considered of value, waste material and / or impurity.

33. (Withdrawn) A method as claimed in claim 32, wherein the region(s) of ore considered of value includes a portion of waste material and / or impurity.

34. (Withdrawn) A method as claimed in claim 27, further including the step of re-iterating an evaluation and / or extraction analysis of the selected material based on the identification of regions.

35. (Withdrawn) A mine analysed in accordance with the method as claimed in claim 27.

36. (Withdrawn) Material extracted from a mine as claimed in claim 35.

37. (Withdrawn) Apparatus adapted to determine characteristics of a selected portion of material, the apparatus including:  
first means to determine the contents of the selected portion of material, and  
means to identify region(s) of material within the selected portion according to at least one of a plurality of characteristic(s).

38. (Withdrawn) Apparatus including processor means adapted to operate in accordance with a predetermined instruction set,  
said apparatus, in conjunction with the instruction set, being adapted to perform the method as claimed in any claim 27.

39. (Withdrawn) A computer program product including:

computer usable medium having computer readable program code and computer readable system code embodied on said medium for determining slope constraints related to a design configuration for extracting material from a particular location within a data processing system, said computer program product including:

computer readable code within said computer usable medium for performing the method as claimed in claim 27.

40. (Withdrawn) A method of analysing a selected volume of material, the material being at least partially comprised of a plurality of blocks, the method including the steps of:

clumping a number of blocks together,  
analysing the selected volume of material based on the clumped blocks.

41. (Withdrawn) A method as claimed in claim 40, wherein a mixed integer optimisation engine is used to analyse the selected volume of material.

42. (Withdrawn) A method as claimed in claim 41, wherein further constraints are incorporated into the engine.

43. (Withdrawn) A method as claimed in claim 42, wherein the further constraints are mining, processing, marketing capabilities and/or grade constraints.

44. (Withdrawn) A method as claimed in claim 40, wherein analysis of the selected volume is performed relatively globally both in space and time.

45. (Withdrawn) A mine analysed in accordance with the method as claimed in claim 40.



46. (Withdrawn) Material extracted from a mine as claimed in claim 45.
47. (Withdrawn) A computer program product including:  
computer usable medium having computer readable program code and computer readable system code embodied on said medium for determining slope constraints related to a design configuration for extracting material from a particular location within a data processing system, said computer program product including:  
computer readable code within said computer usable medium for performing the method as claimed in claim 40.
48. (Withdrawn) Apparatus adapted to analyse a selected volume of material, the material being at least partially comprised of a plurality of blocks, the apparatus including:  
first means for clumping a number of blocks together,  
second means for analysing the selected volume of material based on the clumped blocks.
49. (Withdrawn) Apparatus including processor means adapted to operate in accordance with a predetermined instruction set,  
said apparatus, in conjunction with the instruction set, being adapted to perform the method as claimed in claim 40.
50. - 66 (Canceled)
67. (Withdrawn) A mine design in accordance with the method as claimed in claim 1.

68. (Withdrawn) Material extracted from a mine in accordance with the design as claimed in claim 12.

69. (Currently Amended) A method of determining extraction of material from a mine having at least one pit comprising:

forming a block model of the pit in which material is divided into a plurality of blocks;

defining processing the blocks of the block model based on at least one criteria to define a plurality of clusters each comprising a plurality of blocks ~~having a predetermined relationship;~~

determining forming a plurality of cones cone for each cluster propagating upwardly by precedent precedence arcs extending from each cluster; and

defining clumps of material by from the intersection of the cones, the clumps comprising volumes of material not crossed by precedence arcs, so that material is extractable from the mine in ~~a desired clump order~~ any extraction ordering of the clumps that is feasible according to the precedence arcs to provide flexibility in the extraction of the material from the mine.

70. (Currently Amended) The method according to claim 69 wherein the ~~predetermined relationship used to define each cluster~~ at least one criteria comprises spatial position of blocks relative to one another.

71. (Currently Amended) The method according to claim 70 comprising determining a ~~wherein the predetermined relationship further comprises the time of extraction~~ for the blocks.

72. (Currently Amended) The method according to claim 70 wherein the ~~predetermined relationship further~~ at least one further criteria comprises a variable selected from the group comprising value of material, grade of material, and material type.

73. (Currently Amended) The method according to claim 70 wherein the 72 further comprising increasing an emphasis of the further criteria ~~predetermined~~ relationship is increased so that clusters are formed from blocks which are more spatially fragmented but more closely follow an optimal extraction schedule.

74. (Currently Amended) The method according to claim 70 wherein the 72 further comprising decreasing an emphasis of the further criteria ~~predetermined~~ relationship is decreased so the clusters are formed from blocks which are spatially compact but ignore an optimal extraction sequence.

75. (Currently Amended) The method according to claim 69 wherein when the plurality of clusters has been defined, the clusters are ordered in time and the plurality of cones are propagated upwardly from each cluster in order of time, and wherein any blocks already assigned to the a first cone are not included in a second cone or any subsequent cone, and any blocks assigned to the second cone are not included in any subsequent cone and so-on.

76. (Currently Amended) The method according to claim 69 wherein the a size of each cluster is controlled to a predetermined size by reducing oversized clusters by reassigning blocks of that cluster according to their probability of belonging to other clusters.

77. (Currently Amended) An apparatus for determining extraction of material from a mine having at least one pit comprising:

a processor for receiving a block model of the pit in which material is divided into a plurality of blocks;

the processor also being for[[:]]:

processing the blocks of the block model based on at least one criteria to define a plurality of clusters each comprising a plurality of blocks;

forming a cone for each cluster propagating upwardly by precedence arcs extending from each cluster; and

defining clumps of material from an intersection of the cones, the clumps comprising volumes of material not crossed by precedence arcs, so that material is extractable from the mine in any extraction ordering of the clumps that is feasible according to the precedence arcs to provide flexibility in the extraction of the material from the mine

~~(a) — defining a plurality of clusters each comprising a plurality of blocks having a predetermined relationship;~~

~~—— (b) — determining a plurality of cones by precedent arcs extending from each cluster; and~~

~~—— (c) — defining clumps of material by the intersection of the cones so that material is extractable from the mine in a desired clump order to provide flexibility in the extraction of the material from the mine.~~

78. (Currently Amended) The apparatus according to claim 77 wherein the ~~predetermined relationship~~ at least one criteria used to define each cluster comprises spatial position of blocks relative to one another.

79. (Currently Amended) The apparatus according to claim 78 wherein the ~~predetermined relationship further comprises~~ the processor is also for determining a time of extraction.

80. (Currently Amended) The apparatus according to claim 78 wherein the ~~predetermined relationship further~~ at least one further criteria comprises a variable selected from the group comprising value of material, grade of material, and material type.

81. (Currently Amended) The apparatus according to claim ~~78~~ 80 wherein ~~the~~ an emphasis of the further criteria ~~predetermined relationship~~ is increased so that clusters are formed from blocks which are more spatially fragmented but more closely follow an optimal extraction schedule.

82. (Currently Amended) The apparatus according to claim ~~78~~ 80 wherein ~~the~~ an emphasis of the further criteria ~~predetermined relationship~~ is decreased so the clusters are formed from blocks which are spatially compact but ignore an optimal extraction sequence.

83. (Currently Amended) The apparatus according to claim 77 wherein the processor is also for, when the plurality of clusters has been defined, ordering the clusters in time and the plurality of cones are propagated upwardly from each cluster in order of time, and wherein any blocks already assigned to ~~the~~ a first cone are not included in a second cone or any subsequent cone, and any blocks assigned to the second cone are not included in any subsequent cone and so-on.

84. (Currently Amended) The apparatus according to claim 77 wherein the processor is also for controlling ~~the~~ a size of each cluster to a predetermined size by reducing oversized clusters by reassigning blocks of that cluster according to their probability of belonging to other clusters.

85. (Currently Amended) A computer readable medium having thereon computer program code which when executed by a processor ~~for determining determines~~ extraction of material from a mine having at least one pit, the computer program code comprising:

code for forming a block model of the pit in which material is divided into a

plurality of blocks;

code for processing the blocks of the block model based on at least one criteria to define ~~defining~~ a plurality of clusters each comprising a plurality of blocks ~~having a predetermined relationship~~;

code for forming a cone for each cluster propagating upwardly by precedence ~~determining a plurality of cones by precedent~~ arcs extending from each cluster; and

code for defining clumps of material ~~by the~~ from an intersection of the cones so that material is extractable from the mine in any extraction ordering of the clumps that is feasible according to the precedence arcs ~~a desired clump order~~ to provide flexibility in the extraction of the material from the mine.

86. (Currently Amended) The ~~program~~ computer readable medium according to claim 85 wherein at least one criteria ~~the code for predetermined relationship~~ used ~~by the code~~ to define each cluster comprises spatial position of blocks relative to one another.

87. (Currently Amended) The ~~program~~ computer readable medium according to claim 86 wherein ~~the comprising~~ code for ~~predetermined relationship~~ further comprises the determining a time of extraction.

88. (Currently Amended) The ~~program~~ computer readable medium according to claim 86 wherein ~~the code for predetermined relationship further~~ at least one further criteria used by the code comprises a variable selected from the group comprising value of material, grade of material, and material type.

89. (Currently Amended) The ~~program~~ computer readable medium according to claim ~~86~~ 88 wherein ~~the code for emphasis of~~ at least one further criteria ~~the further~~

~~predetermined relationship~~ is increased so that clusters are formed from blocks which are more spatially fragmented but more closely follow an optimal extraction schedule.

90. (Currently Amended) The ~~program~~ computer readable medium according to claim ~~86~~ 88 wherein ~~the code for~~ emphasis of at least one further criteria ~~the further~~ ~~predetermined relationship~~ is decreased so the clusters are formed from blocks which are spatially compact but ignore an optimal extraction sequence.

91. (Currently Amended) The ~~program~~ computer readable medium according to claim 85 wherein comprising code for when the ~~code for~~ plurality of clusters has have been defined, ordering the clusters ~~are ordered~~ in time and propagating the plurality of cones ~~are propagated~~ upwardly from each cluster in order of time, and wherein any blocks already assigned to ~~the~~ a first cone are not included in a second cone or any subsequent cone, and any blocks assigned to the second cone are not included in any subsequent cone and so-on.

92. (Currently Amended) The ~~program~~ computer readable medium according to claim 85 further comprising code for controlling ~~the~~ a size of each cluster to a predetermined size by reducing oversized clusters by reassigning blocks of that cluster according to their probability of belonging to other clusters.